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ORIGINAL ARTICLE

DESIGN AND IMPLEMENTATION OF REMOTELY CONTROLLED LAWN MOWER

PRACHI RAJARAPOLLU, PRASHANT KADUKAR, SIDDHARTH KOTHARI, SUSHIL BHOSALE

MIT Academy of Engineering, Pune

Abstract:

This paper shows the design of an open-ended, less specified project for remotely controlled lawn cutting robot. Since there is no good solutions in the medium segment when it comes to a concern for the environment we have chosen to approach our process in a respectful way regarding the environment. Quality is often reflected upon technical solutions and the level of advanced components the more advanced technology the higher risk of something breaking down. Historically lawnmowers are usually seen as products with high quality. They last for a long time, sometimes for several decades. The long life can be explained by the use of long-lasting materials and most often a solid assembly. The robot must simulate lawn mowing, by installing markers on its body, which can map where it has been on the surface provided. The robot must be able to distinguish any obstacles set up on the surface and navigate around them, without any outside interference. The entire surface provided to simulate the lawn mowing process on must be totally covered by the robot, or as much of it as possible as the case may be. The robot should navigate the surface area as quickly as possible. All above point are taken into consideration when the robot is designed.

KEYWORDS:

Lawnmower, Robot design, Controller, Chassis etc.

INTRODUCTION:

Grass as most other plants grow during a certain period of the year. This can off course differ some depending on where in the world you are. During this period we can cut the grass 1-2 times a week. The grass is then entering a period of low growing rate, mostly due to the sun, drying the soil. While cutting the lawn one should take care not to cut the grass to short. A good rule is to cut about one third of the grass length at a time. The grass can be very sensitive and can be damaged if you cut too much at one time as shown in fig. 01. The purpose of this project is to design and build a remote controlled lawn mower. This would be beneficial because man power is not required in mowing the lawn on those hot summer days, where you would prefer not to be out in the sun[1]. The remote will allow the user to control the speed and direction of the lawn mower by moving the joy sticks. For safety purposes, the engine of the lawn mower can be turned off via remote.

DESIGN SPECIFICATIONS

The main objective of this project is to turn a push lawn mower into a remote control lawn mower,

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where pushing is eliminated by battery power. The battery will be used to power the dc motors, which will turn the gears and cause the wheels to turn with greater torque then what the dc motor can produce. The steering of the lawn mower will be done in a skid steer fashion by having the wheels turn in the opposite direction causing the lawn mower to turn either left or right, with swivel wheels in the front.

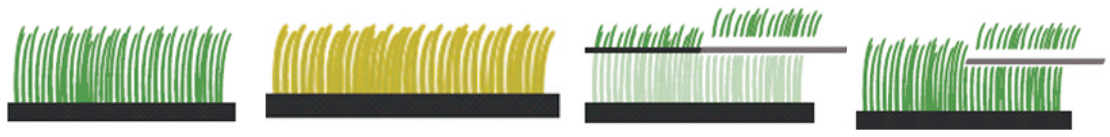


Fig. 01 : Different Grass stages and cutting levels

Generally we see one person cut the lawn by using wired lawn cutting machine and after that two or three person collecting the grass spreading over there. Hence remotely operated vehicle using radio frequency transmitter and receiver has been implemented also the movement of the base is to be control with the speed regulation capability [2]. Therefore we have constructed the vehicle operated wirelessly with the help of RF trans-receiver pair. Normally we are controlling the basic four movements of the vehicle i.e. Forward, Backward, Left and Right also controlling the speed of motors that is done with the help of pulse width modulation techniques. By varying the voltage across the motors we can control the speed of dc motor [3]. In our paper we have concentrated on,

1.To design the remotely operated vehicle which can be controlled by the normal 4x4 keypad.
2.To control the position of the vehicle i.e. Forward, Backward, Left and Right
3.The additional part is to regulate the speed of vehicle.
4.The commands to regulate the speed is such as have half speed of normal speed and 70 % of normal speed this is done by PWM. The design of Lawn cutting robot is given in fig. 2.

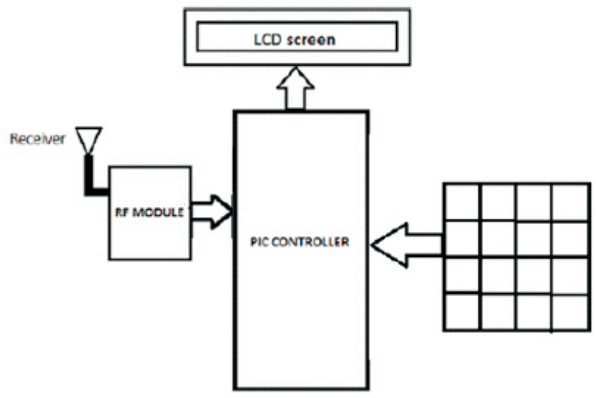


Fig. 02: Hardware design of Lawn cutting mower at transmitting end

a. Transmitter Section

In the transmitter side the control word generation is done by keyboard. In this circuit we are just interface the keyboard to the PIC controller as the controller is used to encode the control bit generated by the keyboard as on other side RF transmitter module is interface to controller to transmit the control signal. Normally the range of trans-receiver pair is a critical factor as it decides the range up to which we can control the vehicle [4]. As per the our project point of view it is up to 30 meters range as it is sufficient to our application area. For the system design we are using the CC2500 module as it is fulfill the criteria.

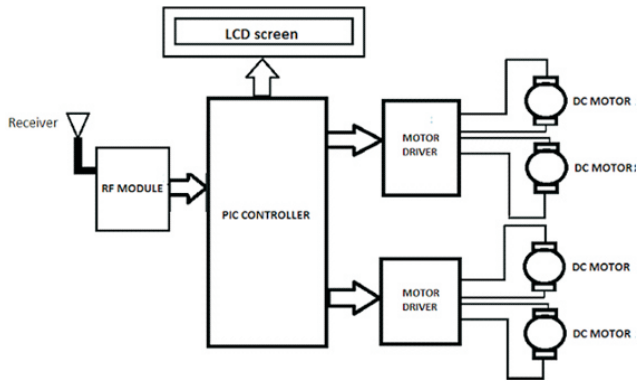


Fig. 03: Hardware design of Lawn cutting mower at receiving end

b. Receiver Section

The robot chassis which is made up of acrylic sheet is used. We use the receiver module interface to PIC controller. The main objective of the controller is to decode the incoming signal comes from transmitter signal. On the other side we are interface the four motors of 200 RPM rating via the motor driver. The motor drivers are necessary when we have to interface the motors to controller. In our design we use two LM298 motor drivers to drive four motors [5]. Each driver is capable to drive the two motors. This is simply DC motors are used as it is cost effective and also have rigid performance. Also we are interface the LCD is of 8 bits to display the name of control action which have to be performed and gave from the transmitter. Normal 12v battery is used to provide the power to the all functional units available on the chassis. Also the basic PCB of the controller is available on the chassis. Hardware design of Lawn cutting mower at receiving end is shown in Fig. 03

c. System Specification

Power Transformer- 12 Volts (receiver) and 9 volts (transmitter).
Filter capacitor: 1000uF,Electrolyte type.
Regulator IC : 7805 IC,3 terminal confg.
LCD display, 8 Bits-2 row,8 data pins-3 control pins.
LED display, 5 volts,1K current limiter.
PIC Controller: High performance RISC CPU.

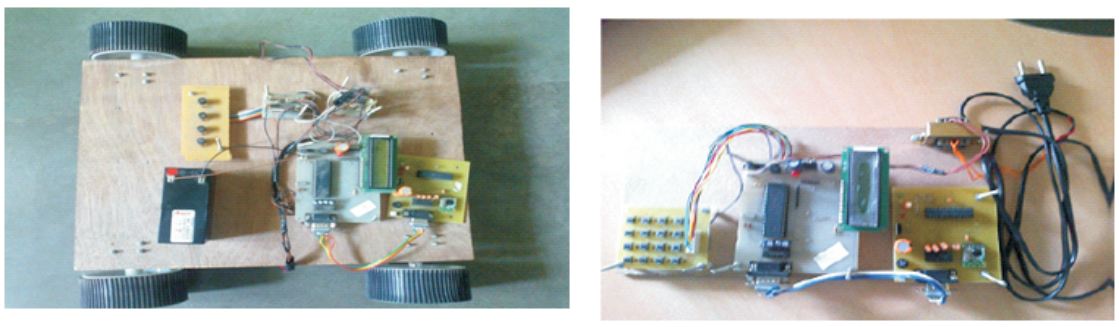


Figure 04: Actual design of the Lawn cutting mower

d. System simulation

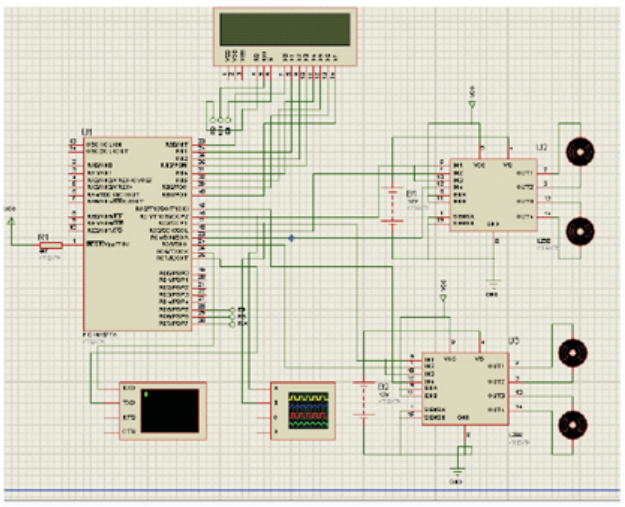
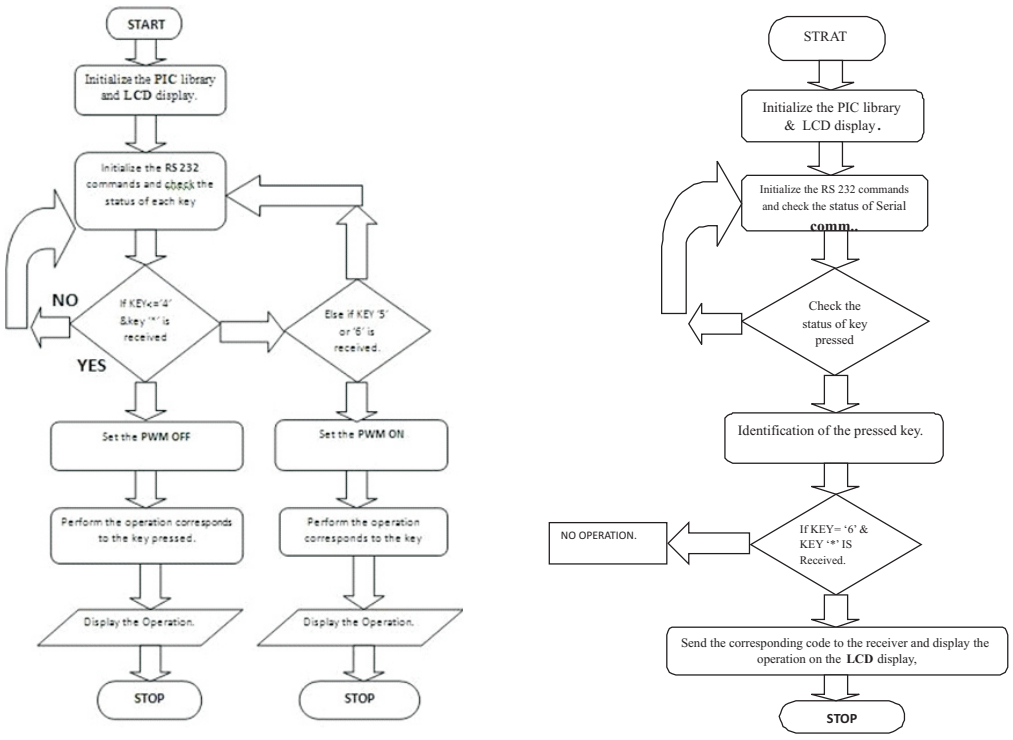


Fig. 05: System simulation with output result

CONCLUSION

Finer quality and more precise sensing devices can be used for better regulation of speed and good control. This is used as base for the lawn cutting assembly as only the cutting mechanism is required to mount on the base of remotely operated vehicle. Also the design of grass collecting assembly to collect the cutter grass enhances the system performance and application area. This prototype has a vast scope for enhancement in future. The cutting assembly is cost effective also. The robot chasse is a cost effective therefore overall system assembly is also cost effective. We have developed a software controlled hardware system that can be employed to control the position and speed of robot. The complete system flowchart is given in fig. 06.



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PRACHI ROHIT RAJARAPOLLU
Assistant Professor , M.E. (Electronics).